DOCUMENT RESUME

ED 195 323 PS 011 744

AUTHOR Wicker, Tommie E.
TITLE The Effects of Cognitive Dissonance or Disequilibrium on Conservation Attainment in Field Dependent and Field Independent Students.
PUB DATE Sep 80
NOTE 20p.: Paper presented at the Annual Convention of the American Psychological Association (88th, Montreal, Quebec, Canada, September 1-5, 1980).

EDRS PRICE MF01/PC01 Plus Postage.
DESCRIPTORS Age Differences: Cognitive Development: *Cognitive Style: *Conservation (Concept): *Elementary School Students: *Kindergarten Children: *Peer Influence: Sex Differences
IDENTIFIERS *Cognitive Dissonance: *Field Dependence: Piagetian Tasks

ABSTRACT

This experimental study investigated (1) the effects of cognitive dissonance on the acquisition of conservation by field dependent (FD) and field independent (FI) elementary school students, and (2) the relationship between cognitive style and cognitive development. In the first phase of the experiment 248 students from kindergarten through third grade were given the Children's Embedded Figures Test (CEFT) and a battery of eight Piagetian tasks. Subjects were identified as FD, mixed FD and FI, or FI, who had attained the stage of conservation, were transitional between stages, or were non-conservers. In the second phase, non-conservers who were FD (N = 30) or FI (N = 24) were directed and trained to make conservation judgements and give reasons that contradicted those they gave in the first phase. Subjects then were asked to give conserving responses in the presence of a peer. This procedure was designed to induce cognitive dissonance among the non-conservers. Among the results, very few FD students gained conservation in first grade, while most FI students were transitional or conserving. By third grade, there were no FI non-conservers and no FD conservers. Significant differences between experimental and control groups are thought to indicate that cognitive dissonance does produce equivalent gains in conservation task performance among both FD and FI students. (Author/MP)

****
* Reproductions supplied by EDRS are the best that can be made *
* from the original document. *
****

ED195323

OCT 14 1980

U S DEPARTMENT OF HEALTH,
EDUCATION & WELFARE
NATIONAL INSTITUTE OF
EDUCATION

THIS DOCUMENT HAS BEEN REPRODUCED EXACTLY AS RECEIVED FROM THE PERSON OR ORGANIZATION ORIGINATING IT. POINTS OF VIEW OR OPINIONS STATED DO NOT NECESSARILY REPRESENT OFFICIAL NATIONAL INSTITUTE OF EDUCATION POSITION OR POLICY

The Effects of Cognitive Dissonance or Disequilibrium on Conservation Attainment in Field Dependent and Field Independent Students

Tommie E. Wicker
College of Education
University of South Carolina
and
Richland I Schools
Columbia, South Carolina

"PERMISSION TO REPRODUCE THIS MATERIAL HAS BEEN GRANTED BY
Tommie E. Wicker
TO THE EDUCATIONAL RESOURCES INFORMATION CENTER (ERIC)."

PS011744

A paper presented at the annual meeting of the American Educational Reserach Associaiton, April, 1980.

Statement of Objectives

This experimental study investigated the effects of cognitive dissonance on the acquisition of conservation by field dependent (FD) and field independent (FI) students. The relationship between cognitive style (FD-FI) as measured by the Children's Embedded Figures Test (CEFT) and cognitive development as measured by a battery of Piagetian tasks was also investigated. Four hypotheses were tested:

1. There is a positive correlation between the field independent dimension and conservation task performance. Supported.
   - 1a. There is a significant difference between the proportions of field dependent, mixed, and field independent students who have obtained conservation. Supported.
   - 1b. There is a developmental aspect to field dependence-independence in that there is a significant difference in the proportions of field independent students at the third grade level when compared to the first grade level. Supported.
2. Cognitive dissonance treatment in a social situation has differential effects on the conservation performance of field dependent and field independent nonconservers with field dependent subjects benefiting more. Not supported.

Perspective(s) or Theoretical Framework

Since 1949, an extensive literature has evolved indicating that FD/FI is a dimension of cognitive style that has implications for academic achievement and for orientation in a variety of problem solving tasks.

Witkin (1977) and others have shown that FD and FI individuals do not seem to be appreciably different in learning ability or memory; however, they do have differences between them in what is attended to and/or salient in specific types of learning, i.e., social learning.

In theory, field-dependence-independence is considered to be one expression of a more general individual difference dimension, defined at one extreme by a global mode of field-approach and at the other extreme by an articulated mode of field-approach (Within, Dyk, Faterson, Goodenouch & Karp, 1974). In people with a relatively global cognitive style, experiences are governed by the organization of the field. By contrast, in people with a relatively articulated cognitive style, experience can be analysed and structured in new ways, depending on the task at hand. Field-independence has been defined as the ability to overcome embedding contexts in perceptual functioning, and it is considered to be the analytical aspect of an articulated mode of field approach as expressed in perception (Goodenough, 1976).

Research has also shown that a social orientation is concommitant with the FD dimension while FI people tend to have more impersonal orientation.

Much research related to Piaget's theory of cognition has concentrated on various methods to improve performance on the various tasks and subsequently promote development at a higher level within the various stages and substages. This has been particularly true of conservation tasks.

A correlation between the FI dimension and various Piagetian tasks has been demonstrated (Case and Pascual-Leon, 1975; Willemsen, Buckholz, Budrow, and Geannacopulos, 1973; and Fleck, 1972). These correlations have generally ranged from .37 (P=.05) to .81 (P.001). Saarni (1973), however, challenged Witkin's ideas that FI is a cognitive style that shows consistency across various kinds of intellectual functioning and indicated a lack of any clear

cut relationship between FI and Piagetian cognitive development. Some conflicting ideas have, therefore, resulted from the available research data.

A number of researchers have emphasized Piaget's idea of disequilibrium as a key process in promoting development. Smedslund (1963), for example, proposed the induction of cognitive conflict as a key element in producing disequilibrium.

Smedslund (1963) and Murray, Ames, and Botvin (1977) suggested that the concept of disequilibrium is related to Festinger's notion of cognitive dissonance as producing changes incognitive functioning.

The Murray, Ames, Botvin study (1977) found that cognitive dissonance in a social situation has produced changes toward conservation responses by nonconserving children. Murray et. al's. study and other literature lead to the present study in which the task attention variable was manipulated through cognitive dissonance in a social situation. It was expected that FD subjects would make gains equal to or greater than the FI subjects on conservation tasks.

Method and/or Techniques

This study involved two phases: 1) a pre-experimental phase during which students in the kindergarten through the third grade were classified on two dimensions, conservation and cognitive style, and 2) an experimental phase involving the inducement of cognitive dissonance to FD and FI nonconservers.

During phase 1, each student was individually administered a pretest of eight traditional conservation tasks-two on the conservation of number, two on the conservation of mass, two on the conservation liquid amount and two on the conservation of weight. With a total possible score of

16, students who had a score of 11 to 16 were called conservers; 5 to 10, transitional; 0 to 4 nonconservers. These same students were also administered the tent series of the CEFT and called FD if they had a score of 0 to 3, mixed (FD-FI) if 4 to 7, and FI if 8 to 11.

During pahse 2, those students who were FD (N=30) or FI (N=24) and who were also nonconservers were placed in a situation in which cognitive dissonance was induced. These students received directions and training to give conservation judgements and reasons that contradicted those they gave on the first phase of the study. These subjects were then asked to give conserving responses in a second session in the presence of a peer. A posttest of the conservation problems was subsequently administered. Cognitive dissonance (disequilibrium) was assumed to occur (i.e., Murray et. al. 1977) when the student gave a response in the presence of a peer which conflicted with the ideas he had expressed earlier.

Data Source

The total sample for this study consisted of 248 kindergarten, first-, second-, and third grade children five to ten years of age from rural school districts in central South Carolina. In order to assure a random, representative sample, every third child from the teacher's alphabetized class lists was selected. Each of these grades consisted of three sections and the students were assigned by the school staff to one of these sections based on his/her achievement level; for example, section 2A consisted of high achievers; 2B a middle group of achiever , and 2C, low achievers. The random selection was consistent over all sections and grades.

Phase 1 as described above involved the total sample. Phase 2 only involved those students identified as FD nonconservers or FI nonconservers. Those students in phase 2 were either in kindergarten or first grade. Second and third graders were not included in phase 2 in order to eliminate age disparity and also because of the small number (N=10) of nonconservers in random sample of these two grades.

Results and Conclusions

A correlational analysis conducted on a sample of 126 (1st, 2nd, 3rd grade) students resulted in a significant relationship ($r=.58$, $p<.001$). This was supportive of a number of prior research studies. One unique aspect of this research is that it looked at the proportions of FD, FD-FI and FI conservers transitional and nonconserving students in the first, second, and third grades. There were significant differences in these proportions in the random samples of first and third graders.

These results indicated that very few FD students gain conservation in first grade while most FI students are transitional or are conserving. By third grade, there were no FI nonconservers and no FD conservers.

Another unique aspect of this research is that it investigated placement in the above noted achievement sections (conservation, and FD-FI) of the first grade students. The majority of low achievers (72%) were nonconservers, 28% were transitional, none were conservers, 52% were transitional, and 14% were conservers. The FD-FI trend was similar. In the low achieving group, 24% were FI, 62% FD-FI, and 14% FD. This would contradict research indicating no differences in the learning ability of FD and FI individuals. Some sex differences favoring females were noted not only in conservation but also in the FD-FI categories. This was also contradictory of prior research. In phase 2,

the experimental situation involved the CEFT (FD-FI) as the independent variable and conservation as the dependent variable. Analysis of variance and T-test indicated no significant differences between the FD and FI experimental groups between the pre- and posttest, nor were any differences noted between the FD and FI control groups. There were, however, significant differences between the FD experimental and FD control and between the FI experimental and FI control between the pretest and the posttest. This would indicate that cognitive dissonance does produce gains in conservation task performance and that there were no differences in the manner in which FD and FI students responded to the treatment.

Although the numbers were small, the females in the experimental groups made greater gains that the males.

Educational Significance and Implications

Although much research has been conducted on the Piagetian conservation tasks and the FD-FI cognitive styles, little research has dealt with combining these two variables to classify individuals and to look at developmental changes as a result of some treatment. This study has attempted to do this and implies that it may be educationally advantageous to look not only at an individual's level of cognitive development but also his cognitive style when planning instructional sequences. This research has implications for the manner in which materials are presented in classroom instruction. It suggests that it may be profitable for teachers to present information in such a manner that an optional amount of dissonance is aroused thereby forcing students to focus their attention on pertinent variables in problem solving.

This research may also imply that the FD-FI dimensions may be a manifestation of a subjects' level of cognitive development rather than a well-defined personality variable prior to seven years of age.

Table 1

Correlations Between the Children's Embedded Figures Test Scores and Piagetian Conservation Tasks Scores by Grade

Grade	N	R	P
1	72	.45	.001
2	25	.20	.35
3	29	.54	.0038

Table 2

Correlations Between the Children's Embedded Figures Test Scores and Piagetian Conservation Task Scores for the Random Sample of First, Second, and Third Graders and for the Total Sample

Group	N	R	P
Random Sample	84	.58	.001
Total Sample	126	.51	.001

Table 3

Number of Students by Sex in Each Piagetian Category

	Nonconservers	Transitional	Conservers	Total
Boys	24 (67%)	10 (28%)	2 (6%)	36 (100%)
Girls	17 (47%)	16 (44%)	3 (8%)	36 (100%)
Total	41 (57%)	26 (36%)	5 (7%)	72 (100%)

Table 4

Number of Students by Sex in Each FD-FI Group

	FD	Mixed	FI	Total
Boys	8 (22%)	20 (56%)	8 (22%)	36 (100%)
Girls	13 (36%)	14 (39%)	9 (25%)	36 (100%)
Total	21 (29%)	34 (47%)	17 (24%)	72 (100%)

Table 5

Percentage of FD, FI and Mixed Students in the High, Middle, and Low Achievement Sections of the First Grade

Cognitive Style Category	First Grade Students' Achievement Group		
	High	Middle	Low
FI	7 (24%)	2 (8%)	0 (0%)
FD-FI	18 (62%)	15 (60%)	9 (50%)
FD	4 (14%)	8 (32%)	9 (50%)

Total = 72

Table 6

Percentage of Conserving, Transitional and Nonconserving Students in the High, Middle and Low Achievement Sections of the First Grade

Conservation Category	First Grade Students' Achievement Group		
	High	Middle	Low
Nonconserver	10 (34%)	18 (72%)	13 (72%)
Transitional	15 (52%)	6 (24%)	5 (28%)
Conserver	4 (14%)	1 (4%)	0 (0%)

Total = 72

Table 7

Mean, Gain Scores on Conservation and Standard Deviations for Experimental and Control Group on the Conservation Tasks

Group	Cognitive Style Category FD	N	FI	N
Experimental	9.13	15	10.86	14
	4.67		4.72	
Control	0.67	15	0.80	10
	1.45		2.62	

Table 8

Analysis of Variance for the Gain Scores of the FD and the FI Subjects in the Control Group

Source of Variation	DF	Mean Square	F	P
Control Groups (FD and FI)	24	0.107	0.03	0.87

Table 9

Analysis of Variance for the Gain Scores of the FD and the FI Subjects in the Experimental Group

Source of Variation	DF	Mean Square	F	P
Experimental Groups (FD and FI)	28	21.52	0.98	0.33

Table 10

Chi Square Table Displaying the Number of Students from the Random Sample who Fall in Each Category of Conservation and Cognitive Style

Cognitive Style Category	Conservation Category			
	Nonconserver	Transitional	Conserver	Total
Field Dependent				
n	11	2	1	14
Row percent	78.6	14.3	7.1	16.7
Column percent	44.0	4.5	6.7	
Percent total	13.1	2.4	1.2	
Mixed (FD-FI)				
n	13	31	6	50
Row percent	26.0	62.0	12.0	59.5
Column percent	52.0	70.5	40.0	
Percent total	15.5	36.9	7.1	
Field Independent				
n	1	11	8	20
Row percent	5.0	55.0	40.0	23.8
Column percent	4.0	25.0	53.3	
Percent total	1.2	13.1	9.5	
Column Total	25	44	15	84
	29.8	52.4	17.9	100.0

Raw chi square = 27.70
DF = 4
Significance = 0.0001

Table 11

Chi Square Table Displaying the Number of Students in the Total First Grade Sample who Fall in Each Category of Conservation and Cognitive Style

Cognitive Style Category	Conservation Category			
	Nonconserver	Transitional	Conserver	Total
Field Dependent				
n	16	5	0	21
Row percent	76.2	23.8	0.0	29.2
Column percent	39.0	19.2	0.0	
Percent total	22.2	6.9	0.0	
Mixed (FD-FI)				
n	23	15	4	42
Row percent	54.8	35.7	9.5	58.3
Column percent	56.1	57.7	80.0	
Percent total	31.9	20.8	5.6	
Field Independent				
n	2	6	1	9
Row percent	22.2	66.7	11.1	12.5
Column percent	4.9	23.1	20.0	
Percent total	2.8	8.3	1.4	
Column Total	41	26	5	72
	56.9	36.1	6.9	100

Raw chi square = 8.60

DF = 4

Significance = 0.0719

Table 12

Chi Square Table Displaying the Number of Students from the Random Sample of First Graders who Fall in Each Category of Conservation and Cognitive Style

Cognitive Style Category	Conservation Category			
	Nonconserver	Transitional	Conserver	Total
Field Dependent				
n	10	1	0	11
Row percent	99.9	9.1	0.0	35.5
Column percent	55.6	9.1	0.0	
Percent total	32.3	3.2	0.0	
Mixed (FD-FI)				
n	8	9	1	18
Row percent	44.4	50.0	5.6	58.1
Column percent	44.4	81.8	50.0	
Percent total	25.8	29.0	3.2	
Field Independent				
n	0	1	1	2
Row percent	0.0	50.0	50.0	6.5
Column percent	0.0	9.1	50.0	
Percent total	0.0	3.2	3.2	
Column Total	18	11	2	31
	58.1	35.5	6.5	100.0

Raw chi square = 13.74

DF = 4

Significance = 0.0082

Table 13

Chi Square Table Displaying the Number of Students from the Random Sample of Second Graders who Fall in Each Category of Conservation and Cognitive Style

Cognitive Style Category	Conservation Category			
	Nonconserver	Transitional	Conserver	Total
Field Dependent				
n	1	0	1	2
Row percent	50.0	0.0	50.0	8.0
Column percent	25.0	0.0	15.3	
Percent total	4.0	0.0	4.0	
Mixed (FD-FI)				
n	2	8	3	13
Row percent	15.4	61.5	30.0	52.0
Column percent	50.0	57.1	42.9	
Percent total	8.0	32.0	12.0	
Field Independent				
n	1	6	3	10
Row percent	10.0	60.0	30.0	40.0
Column percent	25.0	42.9	42.9	
Percent total	4.0	24.0	12.0	
Column Total	4	14	7	25
	16.0	56.0	28.0	100.0

Raw chi square = 3.37

DF = 4

Significance = 0.50

Table 14

Chi Square Table Displaying the Number of Students from the Random Sample of Third-Graders who Fall in Each Category of Conservation and Cognitive Style

Cognitive Style Category	Conservation Category			
	Nonconserver	Transitional	Conserver	Total
Field Dependent				
n	2	1	0	3
Row percent	66.7	33.3	0.0	10.3
Column percent	33.3	5.6	0.0	
Percent total	6.9	3.4	0.0	
Mixed (FD-FI)				
n	4	13	1	18
Row percent	22.2	72.2	5.6	62.1
Column percent	66.7	72.2	20.0	
Percent total	13.8	44.8	3.4	
Field Independent				
n	0	4	4	8
Row percent	0.0	50.0	50.0	27.6
Column percent	0.0	22.2	80.0	
Percent total	0.0	13.8	13.8	
Column Total	6	18	5	29
	20.7	62.1	17.2	100.0

Raw chi square = 12.55

DF = 4

Significance = 0.0137

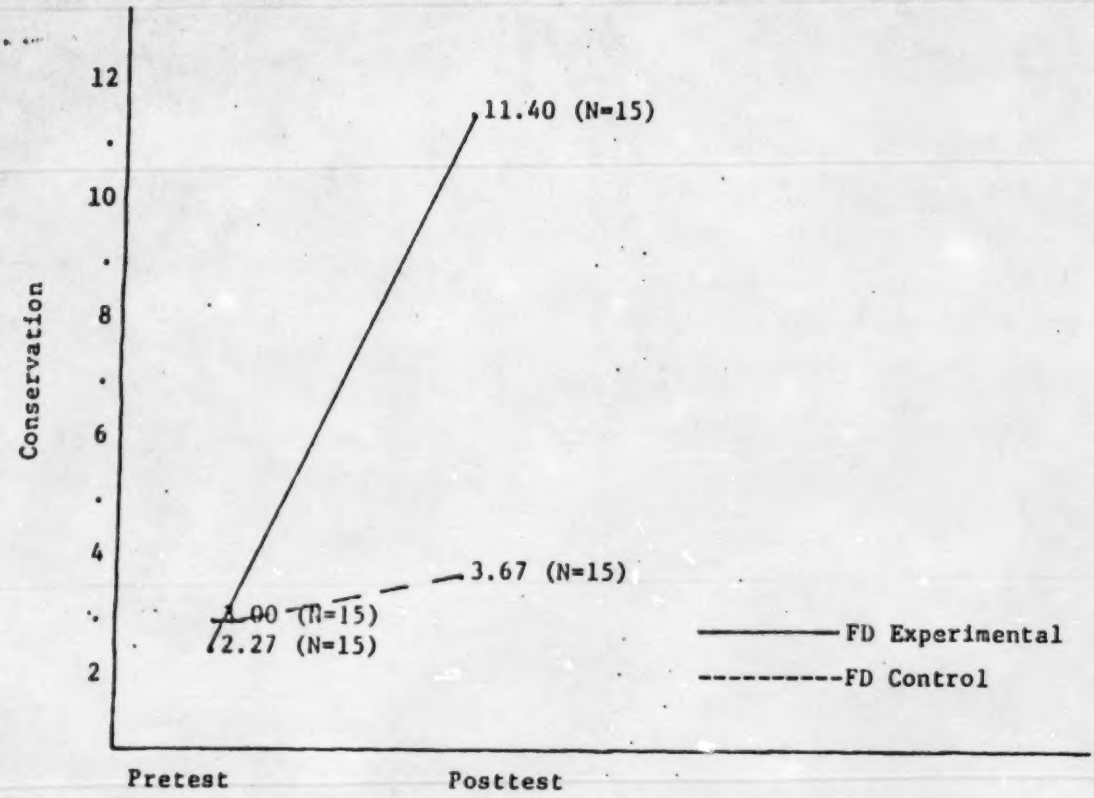

Figure 1. Means of Field Dependent Experimental and Control Groups on Conservation Pretest and Posttest.

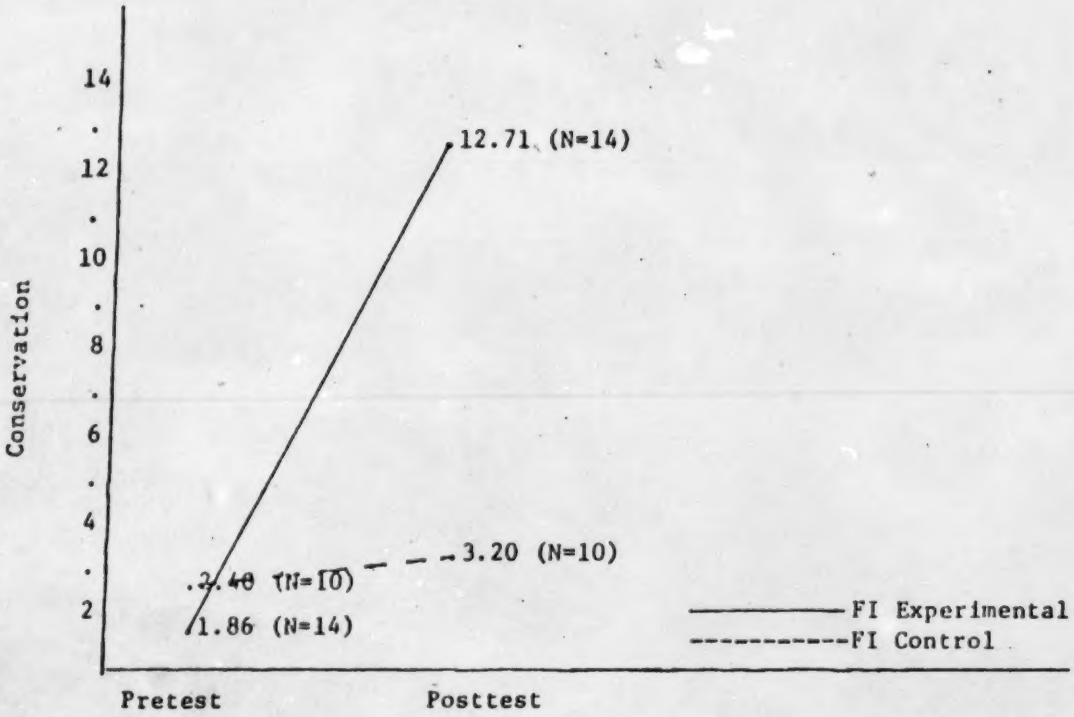

Figure 2. Means of Field Independent Experimental and Control Groups on Conservation Pretest and Posttest.

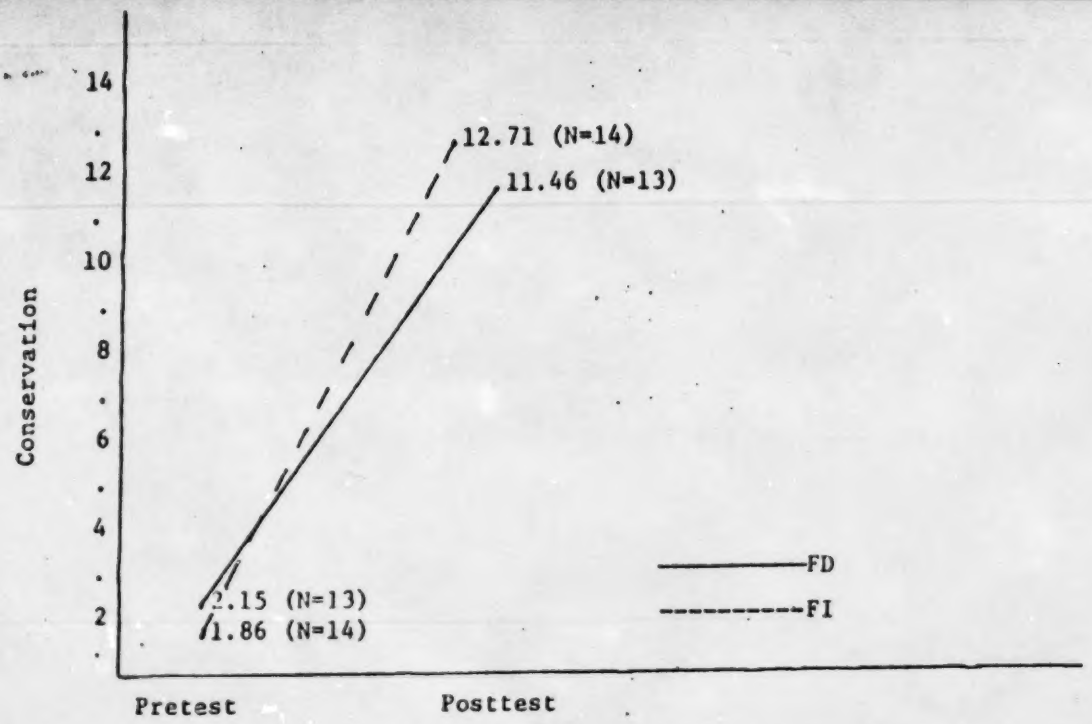

Figure 3. Means of Field Dependent and Field Independent Experimental Groups on the Pretest and Posttest.

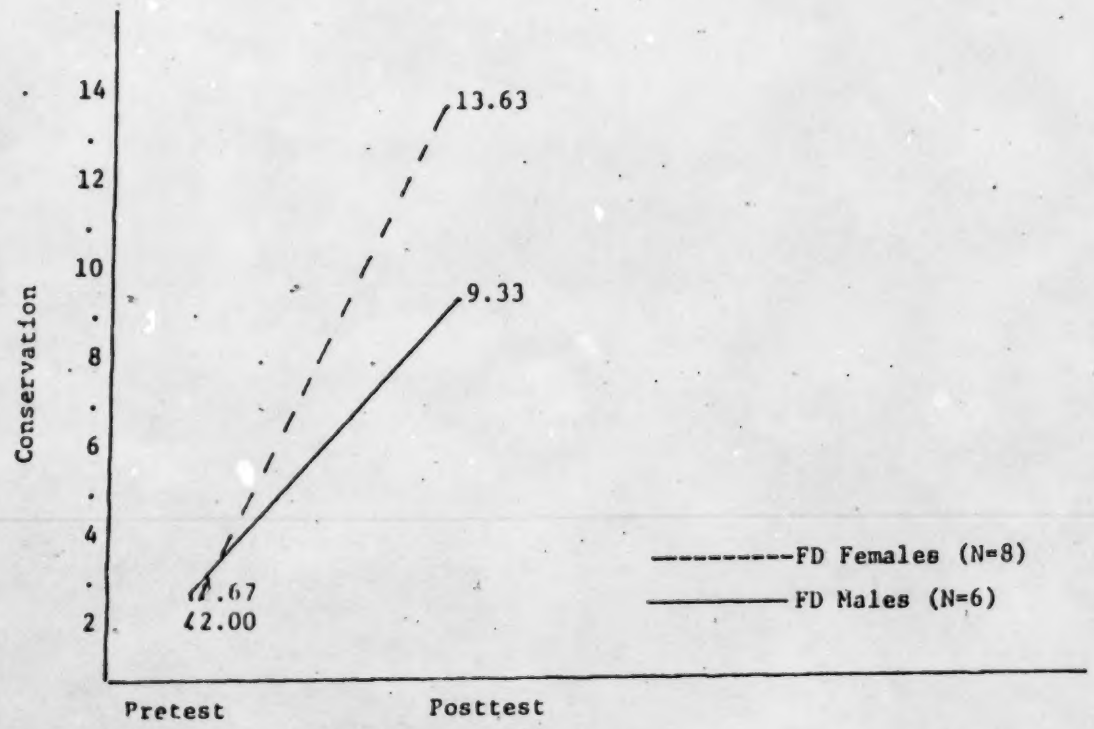

Figure 4. Pretest and Posttest Conservation Scores of FD Experimental Groups by Sex.

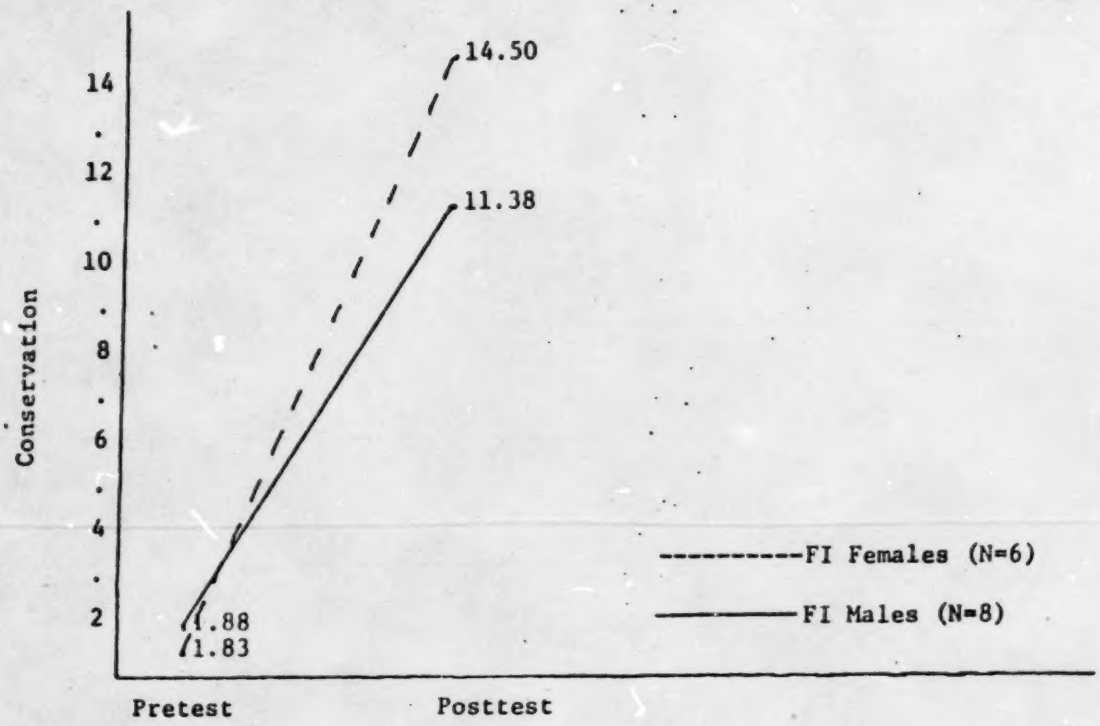

Figure 5. Pretest and Posttest Conservation Scores of FI Experimental Groups by Sex.

Case, Robbie.& Pascual-Leon,Juan. Failure of conservation training of disadvantaged black teenagers: A neo-Piagetian interpretation. Perceptual and Motor Skills, 1975, 40, 545-546.

Fleck, J.Roland. Cognitive styles in children and performance on Piagetian conservation tasks. Perceptual and Motor Skills, 1972, 35, 747-756.

Goodenough, D.R. The role of individual differences in field dependence as a factor in learning and memory. Psychological Bulletin, 1976, 83, 675-694.

Murray, Frank B. Ames, Gail J. & Botvin, Gilbert J. Acquisition of conservation through cognitive dissonance. Journal of Educational Psychology, 1977, 69, 5, Pp. 519-527.

Saarni, Carolyn I. Piagetian operations and field independence as factors in children's problem-solving performance. Child Development, 1973, 44, 338-345.

Smedslund, Jan. Patterns of experience and the acquisition of conservation of length. Scandinavian Journal of Psychology , 1963,4, 257-264.

Willemsen, Eleanor. Buchholz, Allen. Budrow, Mary Sue. & Geannacopulos, Nickie. Relationship between Witkin's rod-and-frame task and Poaget's water-line task for college women. Perceptual and Motor Skills, 1973, 36, 956.

Witkin, H.A. Dyk, R.B. Paterson, H.F. Goodenough, D.R., Karp, S.A. Psychological Differentiation: Studies of Development. Potomac, Md.: Lawrence Erlbaum Associates, 1974.

Witkin, H.A. Moore, C.A. Goodenough, D.R.& Cox, P.W. Field-dependent and field-independent cognitive styles and their educational implications. Review of Educational Research, 1977, 47, Pp. 1-64.